Web Map Services for Hurricane Data

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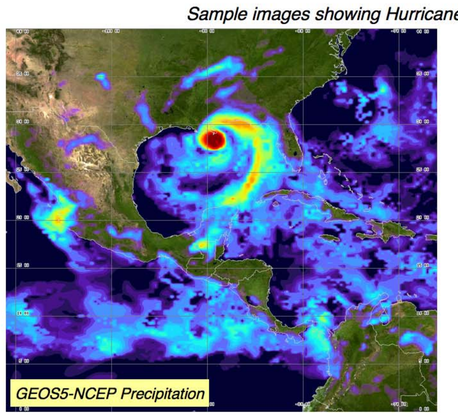
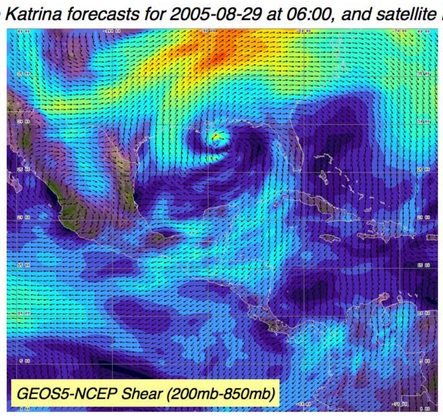
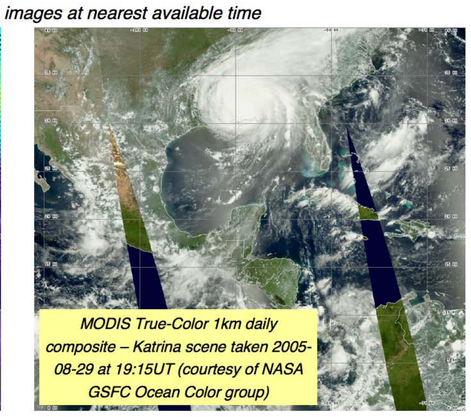
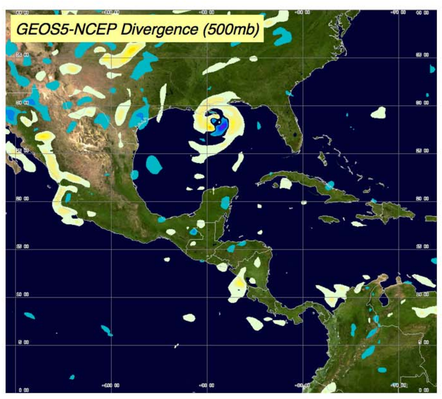
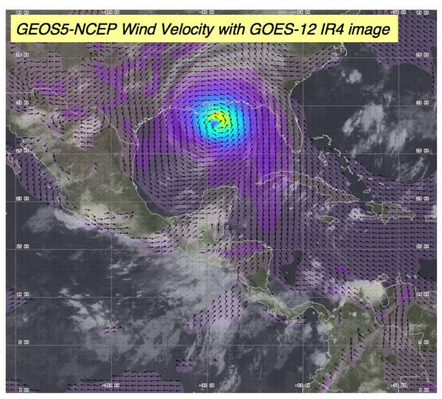
Sample images showing Hurricane Katrina forecasts for 2005-08-29 at 06:00, and satellite images at nearest available time

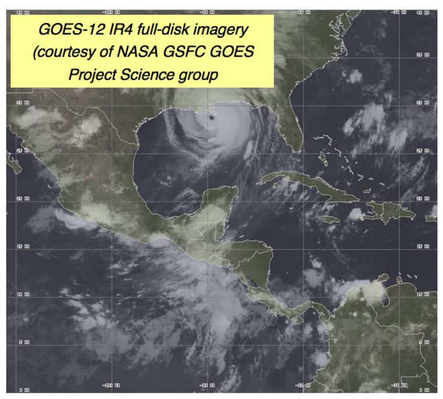












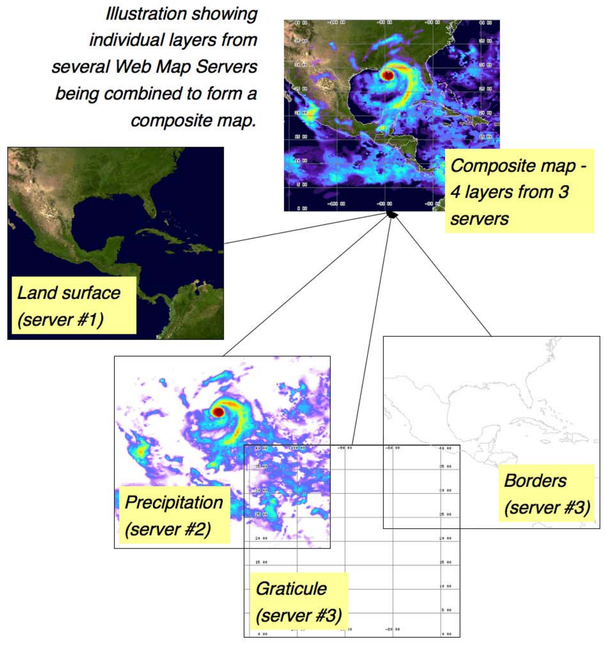
Summary

- We have established several Web Map Services (WMS) that provide visualizations of numerical weather model data and satellite observations in support of NASA's Modeling, Analysis and Prediction Program 2005 Intensive Analysis (MAP05) Hurricane Project.
- The primary data component visualized is the voluminous output (>60GB/day) from the Goddard Earth Observing System (GEOS) incorporating the finite-volume General Circulation Model (fvGCM).
- Cloud imagery from the MODIS and GOES sensors, and other ancillary datasets, are also provided.

Web Map Service (WMS)

- WMS is a web service interoperability specification that standardizes how images of geospatial information are requested over the Web.
- WMS allows users to specify exactly the dataset(s), times, geographic area and output size desired.
- WMS clients can combine output from multiple WMS servers, thus producing a unified view of information stored in a distributed network *(see illustration below)*.
- WMS was developed by the Open Geospatial Consortium (OGC).
- Release as ISO 19128 (International Standard) is pending.

Illustration showing individual layers from several Web Map Servers being combined to form a composite map.

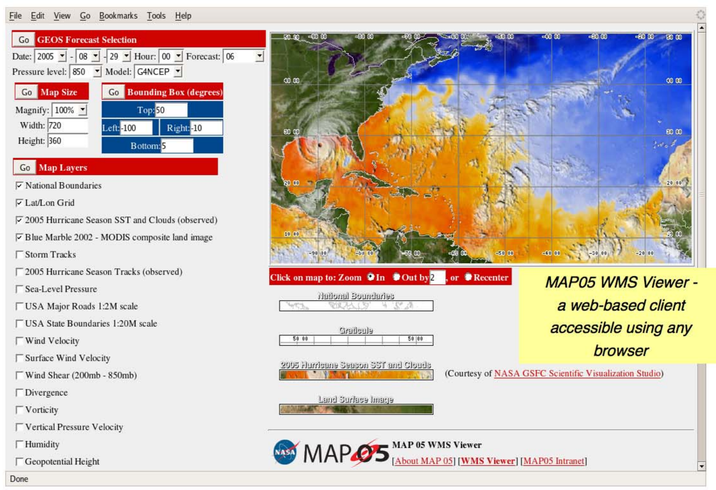


Results and Plans

- Web Map Service for time-dependent and height-dependent hurricane data established for the MAP05 project.
- Access to the public MAP05 WMS is available using the Viewer at http://map05.gsfc.nasa.gov/cgi-bin/viewer.cgi *(satellite images now available; model forecasts are to become public by January 2006).*
- MAP05 WMS used with web-based Viewer at desktop provides easy browsing of data.
  - Usually no need to download large datasets for local analysis.
- Multi-screen hyperwall showing WMS-generated images used in GSFC weather briefings and at Supercomputing 2005 conference.
- Other GSFC projects have expressed interest in WMS for their data after having seen the MAP05 WMS.

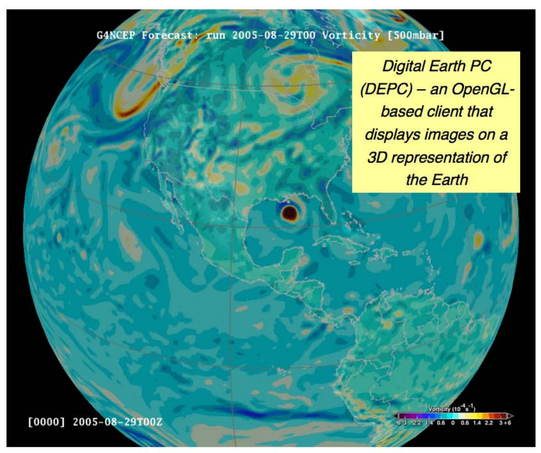
- Future customers may include:
  - MERRA (Modern Era Retrospective-analysis for Research and Applications)
  - CEOP (Coordinated Enhanced Observing Period)
  - NASA/EPA Air Quality application
  - MAP06

- Future enhancements:
  - Web Coverage Service (WCS) - request subsets of numeric data
  - Height profiles, temporal profiles

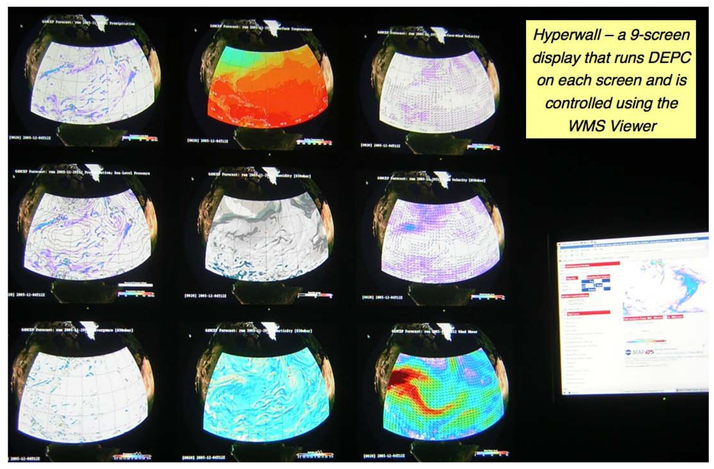


MAP05 WMS Viewer - a web-based client accessible using any browser

Because the WMS specification is an open standard, a variety of client applications can request images from it. Several clients used at GSFC are shown here.

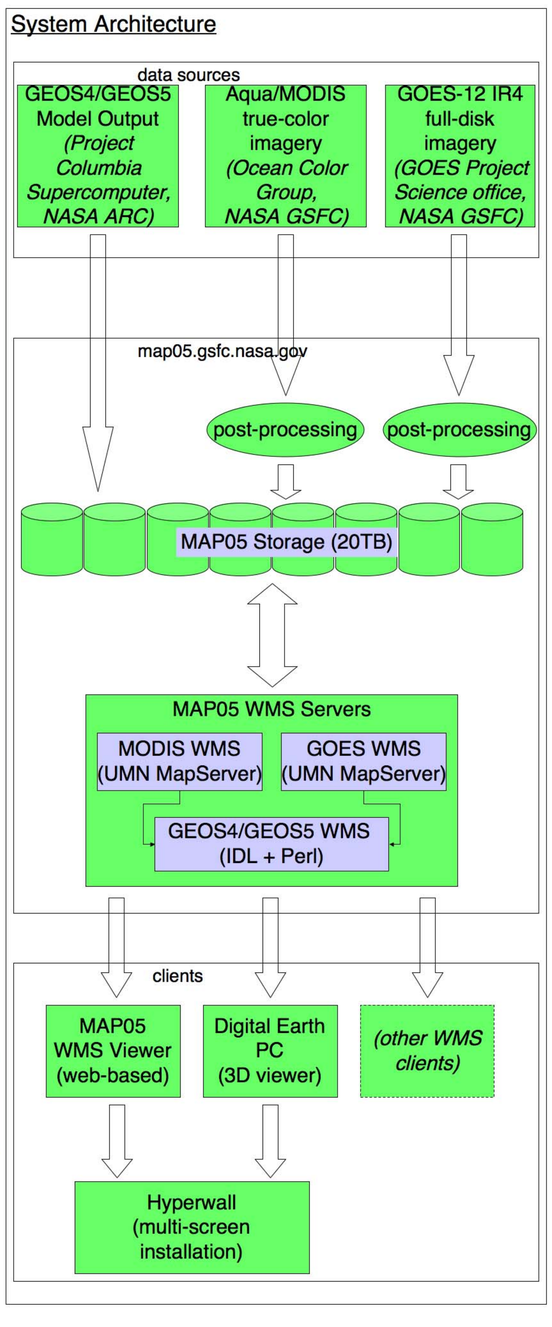


Digital Earth PC (DEPC) – an OpenGL-based client that displays images on a 3D representation of the Earth



Hyperwall – a 9-screen display that runs DEPC on each screen and is controlled using the WMS Viewer

System Architecture



MAP05 Project

- Supported by NASA's Modeling, Analysis and Prediction Program
- Intensive analysis of model forecasts during 2005 hurricane season
- Test GEOS4-NCEP and GEOS5-NCEP models (Goddard Earth Observing System 4th and 5th generation models, initialized using data from National Centers for Environmental Prediction)
- Each model runs 4 times/day, generating 6hr forecasts for 120hrs into the future.

Acknowledgements: support is provided by

- NASA Geosciences Interoperability Office (GIO): WMS Server development http://gio.gsfc.nasa.gov/
- NASA GSFC Scientific Visualization Studio (SVS) WMS Client development http://svs.gsfc.nasa.gov/
- NASA GSFC Software Integration and Visualization Office (SIVO) MAP05 project management and system administration http://sivo.gsfc.nasa.gov/